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RAW SEQUENCE LISTING

PATENT APPLICATION: US/10/685,237

DATE: 08/02/2004

TIME: 14:39:24

Input Set : N:\Crf3\RULE60\10685237.raw

Output Set: N:\CRF4\08022004\J685237.raw

SEQUENCE LISTING

1 (1) GENERAL INFORMATION:

2 (i) APPLICANT: Kenneth B. Stokes
 3 Jos,e Morissette

4 (ii) TITLE OF INVENTION: SYSTEMS FOR ENHANCING CARDIAC SIGNAL
 5 SENSING BY CARDIAC PACEMAKERS THROUGH
 6 GENETIC TREATMENT

7 (iii) NUMBER OF SEQUENCES: 12

8 (iv) CORRESPONDENCE ADDRESS:

9 (A) ADDRESSEE: Woodcock Washburn Kurtz Mackiewicz & Norris LLP
 10 (B) STREET: One Liberty Place - 46th Floor
 11 (C) CITY: Philadelphia
 12 (D) STATE: PA
 13 (E) COUNTRY: U.S.A.
 14 (F) ZIP: 19103

15 (v) COMPUTER READABLE FORM:

16 (A) MEDIUM TYPE: Floppy disk
 17 (B) COMPUTER: IBM PC compatible
 18 (C) OPERATING SYSTEM: PC-DOS/MS-DOS
 19 (D) SOFTWARE: WordPerfect 6.1

20 (vi) CURRENT APPLICATION DATA:

C--> 21 (A) APPLICATION NUMBER: US/10/685,237
 C--> 22 (B) FILING DATE: 14-Oct-2003
 W--> 23 (C) CLASSIFICATION:

24 (vii) PRIOR APPLICATION DATA:

25 (A) APPLICATION NUMBER: US/09/514,907
 26 (B) FILING DATE: 08-Feb-2000

29 (viii) ATTORNEY/AGENT INFORMATION:

30 (A) NAME: Paul K. Legaard
 31 (B) REGISTRATION NUMBER: 38,534
 32 (C) REFERENCE/DOCKET NUMBER: MEDT-0029/P-3586

33 (ix) TELECOMMUNICATION INFORMATION:

34 (A) TELEPHONE: (215) 568-3100
 35 (B) TELEFAX: (215) 568-3439

36 (2) INFORMATION FOR SEQ ID NO: 1:

37 (i) SEQUENCE CHARACTERISTICS:

38 (A) LENGTH: 6048 bases
 39 (B) TYPE: nucleic acid
 40 (C) STRANDEDNESS: double
 41 (D) TOPOLOGY: linear

42 (xi) SEQUENCE DESCRIPTION: SEQ ID NO: 1:

43 ATG GCA AAC TTC CTA TTA CCT CGG GGC ACC AGC AGC TTC CGC AGG 45
 44 Met Ala Asn Phe Leu Leu Pro Arg Gly Thr Ser Ser Phe Arg Arg

ENTERED

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45	1	5	10	15	
46	TTC ACA CGG GAG TCC	CTG GCA GCC ATC	GAG AAG CGC ATG	GCG GAG	90
47	Phe Thr Arg Glu Ser	Leu Ala Ala Ile	Glu Lys Arg Met	Ala Glu	
48		20	25	30	
49	AAG CAA GCC CGC GGC	TCA ACC ACC TTG	CAG GAG AGC CGA	GAG GGG	135
50	Lys Gln Ala Arg Gly	Ser Thr Thr Leu	Gln Glu Ser Arg	Glu Gly	
51		35	40	45	
52	CTG CCC GAG GAG GAG	GCT CCC CGG CCC	CAG CTG GAC CTG	CAG GCC	180
53	Leu Pro Glu Glu Glu	Ala Pro Arg Pro	Gln Leu Asp Leu	Gln Ala	
54		50	55	60	
55	TCC AAA AAG CTG CCA	GAT CTC TAT GGC	AAT CCA CCC CAA	GAG CTC	225
56	Ser Lys Lys Leu Pro	Asp Leu Tyr Gly	Asn Pro Pro Gln	Glu Leu	
57		65	70	75	
58	ATC GGA GAG CCC CTG	GAG GAC CTG GAC	CCC TTC TAT AGC	ACC CAA	270
59	Ile Gly Glu Pro Leu	Glu Asp Leu Asp	Pro Phe Tyr Ser	Thr Gln	
60		80	85	90	
61	AAG ACT TTC ATC GTA	CTG AAT AAA GGC	AAG ACC ATC TTC	CGG TTC	315
62	Lys Thr Phe Ile Val	Leu Asn Lys Gly	Lys Thr Ile Phe	Arg Phe	
63		95	100	105	
64	AGT GCC ACC AAC GCC	TTG TAT GTC CTC	AGT CCC TTC CAC	CCA GTT	360
65	Ser Ala Thr Asn Ala	Leu Tyr Val Leu	Ser Pro Phe His	Pro Val	
66		110	115	120	
67	CGG AGA GCG GCT GTG	AAG ATT CTG GTT	CAC TCG CTC TTC	AAC ATG	405
68	Arg Arg Ala Ala Val	Lys Ile Leu Val	His Ser Leu Phe	Asn Met	
69		125	130	135	
70	CTC ATC ATG TGC ACC	ATC CTC ACC AAC	TGC GTG TTC ATG	GCC CAG	450
71	Leu Ile Met Cys Thr	Ile Leu Thr Asn	Cys Val Phe Met	Ala Gln	
72		140	145	150	
73	CAC GAC CCT CCA CCC	TGG ACC AAG TAT	GTC GAG TAC ACC	TTC ACC	495
74	His Asp Pro Pro Pro	Trp Thr Lys Tyr	Val Glu Tyr Thr	Phe Thr	
75		155	160	165	
76	GCC ATT TAC ACC TTT	GAG TCT CTG GTC	AAG ATT CTG GCT	CGA GCT	540
77	Ala Ile Tyr Thr Phe	Glu Ser Leu Val	Lys Ile Leu Ala	Arg Ala	
78		170	175	180	
79	TTC TGC CTG CAC GCG	TTC ACT TTC CTT	CGG GAC CCA TGG	AAC TGG	585
80	Phe Cys Leu His Ala	Phe Thr Phe Leu	Arg Asp Pro Trp	Asn Trp	
81		185	190	195	
82	CTG GAC TTT AGT GTG	ATT ATC ATG GCA	TAC ACA ACT GAA	TTT GTG	630
83	Leu Asp Phe Ser Val	Ile Ile Met Ala	Tyr Thr Thr Glu	Phe Val	
84		200	205	210	
85	GAC CTG GGC AAT GTC	TCA GCC TTA CGC	ACC TTC CGA GTC	CTC CGG	675
86	Asp Leu Gly Asn Val	Ser Ala Leu Arg	Thr Phe Arg Val	Leu Arg	
87		215	220	225	
88	GCC CTG AAA ACT ATA	TCA GTC ATT TCA	GGG CTG AAG ACC	ATC GTG	720
89	Ala Leu Lys Thr Ile	Ser Val Ile Ser	Gly Leu Lys Thr	Ile Val	
90		230	235	240	
91	GGG GCC CTG ATC CAG	TCT GTG AAG AAG	CTG GCT GAT GTG	ATG GTC	765
92	Gly Ala Leu Ile Gln	Ser Val Lys Lys	Leu Ala Asp Val	Met Val	
93		245	250	255	

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94	CTC ACA GTC TTC TGC CTC AGC GTC TTT GCC CTC ATC GGC CTG CAG	810
95	Leu Thr Val Phe Cys Leu Ser Val Phe Ala Leu Ile Gly Leu Gln	
96	260 265 270	
97	CTC TTC ATG GGC AAC CTA AGG CAC AAG TGT GTG CGC AAC TTC ACA	855
98	Leu Phe Met Gly Asn Leu Arg His Lys Cys Val Arg Asn Phe Thr	
99	275 280 285	
100	GCG CTC AAC GGC ACC AAC GGC TCC GTG GAG GCC GAC GGC TTG GTC	900
101	Ala Leu Asn Gly Thr Asn Gly Ser Val Glu Ala Asp Gly Leu Val	
102	290 295 300	
103	TGG GAA TCC CTG GAC CTT TAC CTC AGT GAT CCA GAA AAT TAC CTG	945
104	Trp Glu Ser Leu Asp Leu Tyr Leu Ser Asp Pro Glu Asn Tyr Leu	
105	305 310 315	
106	CTC AAG AAC GGC ACC TCT GAT GTG TTA CTG TGT GGG AAC AGC TCT	990
107	Leu Lys Asn Gly Thr Ser Asp Val Leu Leu Cys Gly Asn Ser Ser	
108	320 325 330	
109	GAC GCT GGG ACA TGT CCG GAG GGC TAC CGG TGC CTA AAG GCA GGC	1035
110	Asp Ala Gly Thr Cys Pro Glu Gly Tyr Arg Cys Leu Lys Ala Gly	
111	335 340 345	
112	GAG AAC CCC GAC CAC GGC TAC ACC AGC TTC GAT TCC TTT GCC TGG	1080
113	Glu Asn Pro Asp His Gly Tyr Thr Ser Phe Asp Ser Phe Ala Trp	
114	350 355 360	
115	GCC TTT CTT GCA CTC TTC CGC CTG ATG ACG CAG GAC TGC TGG GAG	1125
116	Ala Phe Leu Ala Leu Phe Arg Leu Met Thr Gln Asp Cys Trp Glu	
117	365 370 375	
118	CGC CTC TAT CAG CAG ACC CTC AGG TCC GCA GGG AAG ATC TAC ATG	1170
119	Arg Leu Tyr Gln Gln Thr Leu Arg Ser Ala Gly Lys Ile Tyr Met	
120	380 385 390	
121	ATC TTC TTC ATG CTT GTC ATC TTC CTG GGG TCC TTC TAC CTG GTG	1215
122	Ile Phe Phe Met Leu Val Ile Phe Leu Gly Ser Phe Tyr Leu Val	
123	395 400 405	
124	AAC CTG ATC CTG GCC GTG GTC GCA ATG GCC TAT GAG GAG CAA AAC	1260
125	Asn Leu Ile Leu Ala Val Val Ala Met Ala Tyr Glu Glu Gln Asn	
126	410 415 420	
127	CAA GCC ACC ATC GCT GAG ACC GAG GAG AAG GAA AAG CGC TTC CAG	1305
128	Gln Ala Thr Ile Ala Glu Thr Glu Glu Lys Glu Lys Arg Phe Gln	
129	425 430 435	
130	GAG GCC ATG GAA ATG CTC AAG AAA GAA CAC GAG GCC CTC ACC ATC	1350
131	Glu Ala Met Glu Met Leu Lys Lys Glu His Glu Ala Leu Thr Ile	
132	440 445 450	
133	AGG GGT GTG GAT ACC GTG TCC CGT AGC TCC TTG GAG ATG TCC CCT	1395
134	Arg Gly Val Asp Thr Val Ser Arg Ser Ser Leu Glu Met Ser Pro	
135	455 460 465	
136	TTG GCC CCA GTA AAC AGC CAT GAG AGA AGA AGC AAG AGG AGA AAA	1440
137	Leu Ala Pro Val Asn Ser His Glu Arg Arg Ser Lys Arg Arg Lys	
138	470 475 480	
139	CGG ATG TCT TCA GGA ACT GAG GAG TGT GGG GAG GAC AGG CTC CCC	1485
140	Arg Met Ser Ser Gly Thr Glu Glu Cys Gly Glu Asp Arg Leu Pro	
141	485 490 495	
142	AAG TCT GAC TCA GAA GAT GGT CCC AGA GCA ATG AAT CAT CTC AGC	1530

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143	Lys Ser Asp Ser Glu Asp Gly Pro Arg Ala Met Asn His Leu Ser	
144	500	505 510
145	CTC ACC CGT GGC CTC AGC AGG ACT TCT ATG AAG CCA CGT TCC AGC	1575
146	Leu Thr Arg Gly Leu Ser Arg Thr Ser Met Lys Pro Arg Ser Ser	
147	515	520 525
148	CGC GGG AGC ATT TTC ACC TTT CGC AGG CGA GAC CTG GGT TCT GAA	1620
149	Arg Gly Ser Ile Phe Thr Phe Arg Arg Arg Asp Leu Gly Ser Glu	
150	530	535 540
151	GCA GAT TTT GCA GAT GAT GAA AAC AGC ACA GCG CGG GAG AGC GAG	1665
152	Ala Asp Phe Ala Asp Asp Glu Asn Ser Thr Ala Arg Glu Ser Glu	
153	545	550 555
154	AGC CAC CAC ACA TCA CTG CTG GTG CCC TGG CCC CTG CGC CGG ACC	1710
155	Ser His His Thr Ser Leu Leu Val Pro Trp Pro Leu Arg Arg Thr	
156	560	565 570
157	AGT GCC CAG GGA CAG CCC AGT CCC GGA ACC TCG GCT CCT GGC CAC	1755
158	Ser Ala Gln Gly Gln Pro Ser Pro Gly Thr Ser Ala Pro Gly His	
159	575	580 585
160	GCC CTC CAT GGC AAA AAG AAC AGC ACT GTG GAC TGC AAT GGG GTG	1800
161	Ala Leu His Gly Lys Lys Asn Ser Thr Val Asp Cys Asn Gly Val	
162	590	595 600
163	GTC TCA TTA CTG GGG GCA GGC GAC CCA GAG GCC ACA TCC CCA GGA	1845
164	Val Ser Leu Leu Gly Ala Gly Asp Pro Glu Ala Thr Ser Pro Gly	
165	605	610 615
166	AGC CAC CTC CTC CGC CCT GTG ATG CTA GAG CAC CCG CCA GAC ACG	1890
167	Ser His Leu Leu Arg Pro Val Met Leu Glu His Pro Pro Asp Thr	
168	620	625 630
169	ACC ACG CCA TCG GAG GAG CCA GGC GGC CCC CAG ATG CTG ACC TCC	1935
170	Thr Thr Pro Ser Glu Glu Pro Gly Gly Pro Gln Met Leu Thr Ser	
171	635	640 645
172	CAG GCT CCG TGT GTA GAT GGC TTC GAG GAG CCA GGA GCA CGG CAG	1980
173	Gln Ala Pro Cys Val Asp Gly Phe Glu Glu Pro Gly Ala Arg Gln	
174	650	655 660
175	CGG GCC CTC AGC GCA GTC AGC GTC CTC ACA AGC GCA CTG GAA GAG	2025
176	Arg Ala Leu Ser Ala Val Ser Val Leu Thr Ser Ala Leu Glu Glu	
177	665	670 675
178	TTA GAG GAG TCT CGC CAC AAG TGT CCA CCA TGC TGG AAC CGT CTC	2070
179	Leu Glu Glu Ser Arg His Lys Cys Pro Pro Cys Trp Asn Arg Leu	
180	680	685 690
181	GCC CAG CGC TAC CTG ATC TGG GAG TGC TGC CCG CTG TGG ATG TCC	2115
182	Ala Gln Arg Tyr Leu Ile Trp Glu Cys Cys Pro Leu Trp Met Ser	
183	695	700 705
184	ATC AAG CAG GGA GTG AAG TTG GTG GTC ATG GAC CCG TTT ACT GAC	2160
185	Ile Lys Gln Gly Val Lys Leu Val Val Met Asp Pro Phe Thr Asp	
186	710	715 720
187	CTC ACC ATC ACT ATG TGC ATC GTA CTC AAC ACA CTC TTC ATG GCG	2205
188	Leu Thr Ile Thr Met Cys Ile Val Leu Asn Thr Leu Phe Met Ala	
189	725	730 735
190	CTG GAG CAC TAC AAC ATG ACA AGT GAA TTC GAG GAG ATG CTG CAG	2250
191	Leu Glu His Tyr Asn Met Thr Ser Glu Phe Glu Glu Met Leu Gln	

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192		740		745		750	
193	GTC GGA AAC CTG GTC TTC ACA GGG ATT TTC ACA GCA GAG ATG ACC					2295	
194	Val Gly Asn Leu Val Phe Thr Gly Ile Phe Thr Ala Glu Met Thr						
195		755		760		765	
196	TTC AAG ATC ATT GCC CTC GAC CCC TAC TAC TAC TTC CAA CAG GGC					2340	
197	Phe Lys Ile Ile Ala Leu Asp Pro Tyr Tyr Tyr Phe Gln Gln Gly						
198		770		775		780	
199	TGG AAC ATC TTC GAC AGC ATC ATC GTC ATC CTT AGC CTC ATG GAG					2385	
200	Trp Asn Ile Phe Asp Ser Ile Ile Val Ile Leu Ser Leu Met Glu						
201		785		790		795	
202	CTG GGC CTG TCC CGC ATG AGC AAC TTG TCG GTG CTG CGC TCC TTC					2430	
203	Leu Gly Leu Ser Arg Met Ser Asn Leu Ser Val Leu Arg Ser Phe						
204		800		805		810	
205	CGC CTG CTG CGG GTC TTC AAG CTG GCC AAA TCA TGG CCC ACC CTG					2475	
206	Arg Leu Leu Arg Val Phe Lys Leu Ala Lys Ser Trp Pro Thr Leu						
207		815		820		825	
208	AAC ACA CTC ATC AAG ATC ATC GGG AAC TCA GTG GGG GCA CTG GGG					2520	
209	Asn Thr Leu Ile Lys Ile Ile Gly Asn Ser Val Gly Ala Leu Gly						
210		830		835		840	
211	AAC CTG ACA CTG GTG CTA GCC ATC ATC GTG TTC ATC TTT GCT GTG					2565	
212	Asn Leu Thr Leu Val Leu Ala Ile Ile Val Phe Ile Phe Ala Val						
213		845		850		855	
214	GTG GGC ATG CAG CTC TTT GGC AAG AAC TAC TCG GAG CTG AGG GAC					2610	
215	Val Gly Met Gln Leu Phe Gly Lys Asn Tyr Ser Glu Leu Arg Asp						
216		860		865		870	
217	AGC GAC TCA GGC CTG CTG CCT CGC TGG CAC ATG ATG GAC TTC TTT					2655	
218	Ser Asp Ser Gly Leu Leu Pro Arg Trp His Met Met Asp Phe Phe						
219		875		880		885	
220	CAT GCC TTC CTA ATC ATC TTC CGC ATC CTC TGT GGA GAG TGG ATC					2700	
221	His Ala Phe Leu Ile Ile Phe Arg Ile Leu Cys Gly Glu Trp Ile						
222		890		895		900	
223	GAG ACC ATG TGG GAC TGC ATG GAG GTG TCG GGG CAG TCA TTA TGC					2745	
224	Glu Thr Met Trp Asp Cys Met Glu Val Ser Gly Gln Ser Leu Cys						
225		905		910		915	
226	CTG CTG GTC TTC TTG CTT GTT ATG GTC ATT GGC AAC CTT GTG GTC					2790	
227	Leu Leu Val Phe Leu Leu Val Met Val Ile Gly Asn Leu Val Val						
228		920		925		930	
229	CTG AAT CTC TTC CTG GCC TTG CTG CTC AGC TCC TTC AGT GCA GAC					2835	
230	Leu Asn Leu Phe Leu Ala Leu Leu Leu Ser Ser Phe Ser Ala Asp						
231		935		940		945	
232	AAC CTC ACA GCC CCT GAT GAG GAC AGA GAG ATG AAC AAC CTC CAG					2880	
233	Asn Leu Thr Ala Pro Asp Glu Asp Arg Glu Met Asn Asn Leu Gln						
234		950		955		960	
235	CTG GCC CTG GCC CGC ATC CAG AGG GGC CTG CGC TTT GTC AAG CGG					2925	
236	Leu Ala Leu Ala Arg Ile Gln Arg Gly Leu Arg Phe Val Lys Arg						
237		965		970		975	
238	ACC ACC TGG GAT TTC TGC TGT GGT CTC CTG CGG CAC CGG CCT CAG					2970	
239	Thr Thr Trp Asp Phe Cys Cys Gly Leu Leu Arg His Arg Pro Gln						
240		980		985		990	

VERIFICATION SUMMARY

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L:21 M:220 C: Keyword misspelled or invalid format, [(A) APPLICATION NUMBER:]
L:22 M:220 C: Keyword misspelled or invalid format, [(B) FILING DATE:]
L:27 M:238 W: Alpha Fields not Ordered, Reordered [(C) CLASSIFICATION:] of (1)(vi)